An absolute blockbuster of a read, this book explores the events behind the largest air disaster in aviation history, a consuming *human* drama of the forces in our lives—emotional, technological, legal. The author of this brilliantly researched, rigorously documented investigative account had exclusive access to family stories, to lawyers, and to the chief designer of the DC-10. *The Last Nine Minutes* gives readers a stunningly epic yet intimate view of the crash.

The world's largest air disaster began for the passengers at noon in a busy airport outside Paris. Prudence Pratt, a red-haired English model, eager to return to her fiancé, a group of vigorous rugby players, an American couple with three small children were among the 334 passengers juggling for space on the doomed DC-10. They had no way of knowing that their tickets would become a lottery for their lives, that within nine minutes after takeoff, with good weather and no hint of trouble, the cargo door would blow out, sending the massive jet screaming down into a French forest in a crash that would involve 24 countries, provoke a controversial, worldwide investigation, and inspire the largest piece of aviation litigation ever brought to the courts.

The painstaking, day-by-day details of that investigation, the long hours of drawing board debates by the plane's designers—men battling to join the needs of pilots to "feel" their ships with an increasingly automated technology—the high-powered, high-pressured executives spending more than a billion dollars to develop and build the DC-10, the passionate involvement of lawyers, the explosive congressional hearings, the fury and grief of families who survived those who died in the crash combine here in a suspense-ridden tale of a struggle against the larger, more hidden moves of bureaucratic design. Here is a drama of staggering technological achievement brought down by human

(continued on back flap)

AUTHOR'S NOTE

In reconstructing events or behavior I have used verifiable details whenever possible. Where no details have been available I have projected behavior with the aid of aviation physiologists and psychologists from the Human Factors Department of the University of Southern California's Safety Center.

Where italics have been used within quotes, emphasis is the author's.

WITH ITS REAR ENGINE speared on the tail like a silver cigar and poised over 30 feet above the ground, the big plane was the most commanding sight at Orly airport.

But Prudence Pratt had no time for tail watching. She was rushing to get home to Stephen after a week-long modeling job in Spain. These trips were always tiring—on location at dawn, trying to dress in a cramped trailer with all the models grabbing for mirrors and accessories, trying to stay fresh and glamorous in wilting heat. But to be delayed a whole day by French incompetence! Air France had overbooked her Malaga–Paris–London flight and bumped her. She had made her way to Paris and called Stephen the night before to tell him what had happened. He'd be at Heathrow to meet her. If she could make her way to the plane through this madhouse.

Swinging the big, soft bags that were a model's trademark, she and the others pressed into the crush of people who were all trying to get back to London. It was like the last train from Berlin—this anxious army of people dashing from ticket counter to ticket counter, trying to get confirmation, change flights, get aboard with friends. What a shambles strikes created. The ground engineers' strike at Heathrow that had caused this chaos was apparently already over. But it had put them so far behind in servicing planes that all BEA and Air France flights to London that day had been canceled. And now thousands of people were being shuffled, with the urgency of Dunkirk, aboard every available craft.

But even in the confusion, Prudence and her friends were a commanding sight. Simply coming home from work, they were playing their looks very low key. Prudence was wearing the flared jeans overalls she'd picked up in New Mexico under her blue military greatcoat and her black boots. But when seven models and their coterie move through an airport on their way to or from a modeling assignment, an aura of glamour and excitement spins up around them. Prudence had matured well beyond thinking that life was all about turning heads in a restaurant. But it was impossible not to feel heads turn and be pleased by it. And when you had Prudence's theatrical flair, and a shiny mane of red hair flying behind you, every airport scene was like the disembarking of a movie star from the old *Queen Elizabeth*.

She and her friends had got tickets on Turkish Airlines' Flight 981 that would be leaving at noon—the four girls and three male models, the stylist, fashion buyer, and editor of the mail-order catalog they had been shooting in Spain.

A pretty, brisk American-looking mother held tightly to her little girl's hand, steering her through the crowd. Her two other children stayed close, as the husband led them through the maze of check-in, security, and boarding passes.

Fay Wright was eager to get home, too. There was school tomorrow, and it was her turn for car pool. The family had had a week's vacation in Spain. Tom had just been made managing director of Merrill Lynch-Brown Shipley Bank's corporate finance activities in London, and Fay had finally been able to break him free of his obligations at work. American corporate families living abroad, as they were, were always under strains of ambition, absence, alien customs. They had needed this week to be together and get in touch. Stranded in Marbella by the strike, they'd had the option of flying to Manchester and taking the train down to London, or flying home via Paris. They'd discussed the alternatives with friends they'd run into at the airport in Spain. The friends had gone to Manchester. They had decided on Paris.

Several other families from the American School in London were coming home from Turkey and the Alps. It was a difficult place for children that day. The crowds of men flying home from the England v. France international rugby match the day before gave Orly-Sud terminal the atmosphere of a pub at closing time. Men had come from rugby clubs all over England. Among the dozens of young men trading jokes and tickets were the team and officers

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made an evening flight home so uncertain that they had canceled the game and grabbed seats on the Turkish plane.

The quiet orderliness of a large group of young Japanese men was like a collective frown at the boisterous rugby boys. All in their early twenties, their purposes were far loftier than a rugby game. For the thirty-eight men, this was a brief educational hiatus between graduation from university and the beginning of work for the companies that would employ them for the rest of their lives—a chance to travel and see at first hand the sights and the corporate and industrial techniques of Europe. An academic elite chosen from thousands of applicants for the jobs they were about to begin, all had prospects of senior management opportunities before them. And each was the focus of family pride and obligations that surpass anything known in the Western world.

There were other Japanese faces in the crowd. Atsuko and Takehiro Higuchi had been married less than a month, and were honeymooning in Europe before Takehiro returned to his architectural practice and, as eldest son, to heavy family obligations.

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Prudence rushed aboard with the rest, 216 of them—196 at first, and then a last-minute flurry of twenty people who were hurriedly found seats, delaying the flight half an hour. Changes kept being made until the moment the doors were locked—changes that would mean life and death. Several people got on, and then got off and gave their tickets to others. One man got word after he had boarded that his wife had surprised him by flying to Paris, and he dashed from the plane to meet her. Ticket switching was easy to do, as immigration does not check the name on the passport against the name on the ticket. Friends flipped coins to see who'd get aboard. Two men with hangovers missed the plane. In the rush, few knew or cared what kind of plane they were boarding. But on the phone the night before, when Prudence had told Stephen that she was coming on Turkish Airlines, he had made some comment about flying on "that" airline, implying that Turks might be better at flying carpets. But she knew it was just that he hated flying. He loathed and feared it as much as she loved it. And yet he traveled all the time.

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He was a partner in a successful law practice that negotiated claims for Lloyd's of London underwriters, and he often flew to Hong Kong, the Bahamas, New York, or Beirut on business. He frequently packed off on the trail of lost emeralds, silver coins . . . deteriorating frog's legs, of damaged, delayed, or stolen shipments of all kinds, protecting Lloyd's interests. It was delicate work, carrying Lloyd's rigorous ethics and reputation for fair and fast payment of claims through a maze of conflicting stories, international smuggling, networks of thieves, and sophisticated attempts

at fraud. Lloyd's was a legend. But it was also a business. Its cases called for discretion, shrewd judgment, and able help.

Whether in a suit or with his dark hair curling over the collar of an open-necked print shirt, he displayed an enigmatic air he carefully nurtured. His good looks and lazy charm made him compellingly attractive. And with his head lowered over a glass of wine and a cigarette, he could make even the description of a boxing match sound sensuous and conspiratorial. But as he talked of his days in Muscat, of drinking with mercenary soldiers on their way to Biafra, dressing for dinner in borrowed "Gulf rig," probing the pink desert city for ways to liberate a trapped shipment of Kuwaiti dinars insured at Lloyd's, he could laugh at his own role in a bad movie.

He did not want his relationship with Prudence to end up as a bad movie. They had been together for two years now, two cautious and independent personalities, and it had worked. They both resisted a relationship based on need. Need made you vulner-

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He did not want his relationship with Prudence to end up as a bad movie. They had been together for two years now, two cautious and independent personalities, and it had worked. They both resisted a relationship based on need. Need made you vulnerable, something neither of them wanted to be. If they did marry, it would never be to hold each other up. He felt the trips were good. He had had a previous relationship where there had been no chance to escape, and he sometimes wondered if trips didn't operate as a pressure valve, preventing tensions or, worse, boredom.

As he hurried into Heathrow airport, he checked with BEA, which acted as handling agents for Turkish Airlines. The flight was late, and Stephen waited. He had spent much of his life waiting for planes. He settled in with the Sunday papers, a London ritual. He lit a cigarette and flicked ashes from his suit. He wondered why he'd worn a suit. He'd even shaved. He supposed it was a spontaneous gesture of pleasure at her coming home. He flipped through the color supplement and spotted a picture of Prudence as a housewife. Or was it Prudence? He was embarrassed to admit that he wasn't always sure. Several times he'd congratulated her on some pictures in such and such a magazine only to be told that they were of somebody else. Prudence played her roles so well—the seductress, the chic matron, the bride. He only knew her natural style, which was one of "cultivated casualness," of blue jeans and battered mini cars. His favorite picture of her was one he had taken the day they'd gone to Brighton—a color snap of her in blue jeans and macintosh, standing on Brighton Pier with her red hair blowing free, the strong jaw giving her face character, the blue-green eyes laughing. Brighton had been one of their very best days together—a silly, spontaneous day when they'd done all the things they *never* did—take a day off, ride the train to Brighton like daytrippers, hike the honky-tonk Pier in pouring rain, eat slimy fish and chips doused in ketchup, and buy

mildly pornographic mementos. The picture would shatter the illusions of the hundreds of thousands of housewives who would revel vicariously in sun-drenched glamour when they read the catalog she'd shot in Spain. He wanted her home. He wanted to see the ivory heart and silver letter *P* he'd given her around her neck. Their symbol of commitment. He checked with BEA again, and they told him the plane was still over forty-five minutes away. It was only a fifty-minute flight, and it sounded to him as if she hadn't even taken off yet. He decided to drop in on friends who lived nearby and have a drink.

The DC-10 was still a novelty in Europe in the spring of 1974. Many eyes at Orly followed it, fascinated, as the tail with the red streaks and symbol of Turkish Airlines wove its way through the Caravelles, 707s, and Tridents in the stately gavotte of the modern jet.

They read the strip of words that ran the length of the fuselage—*THY TURK HAVA YOLLARI—TURKISH AIRLINES TC-JAV*. En route to London from Istanbul that first Sunday in March, the Turkish DC-10 did have a commanding presence. With its huge rear engine apparently pierced by the fin—a phallic symbol—it was the most virile aircraft around. Clean and workmanlike, it had its vital power source right up where you could see it. Functional, direct, the DC-10 moved the air in a straight line from intake to exhaust. No sacrifice of efficiency for visual elegance.

It was the youngest in the distinguished family of Douglas aircraft, successor to the legendary DC-3, the -4, the -6 and the -7, and the pure jets, the DC-8 and -9. It had been tested more than any of Douglas's previous planes, all to achieve the mission of "building an airplane that's not going to cause the guy any trouble," as a Douglas executive had described it. Douglas, like the rest of the aviation industry, was driven by the concept of *mission*—the striving for goals as if for the Holy Grail. Douglas was proud of the DC-10. It was their baby.

It had had some problems, but all new planes had a debugging period. Debugging was built into cost estimates. Certain cautious passengers stayed away from any new plane for the first two years on general principle, for everybody in aviation knew that an airplane got better as it got older. The DC-10's cargo door had been causing some operational delays—something airlines didn't like. And a door had blown out over Windsor, fifteen months ago. . . .

But pilots loved the plane. The two Turkish pilots had landed Turk Hava Yollari's Flight 981 at 11:02 that morning, completing the first and longest leg of the journey to London. As TC-JAV

nosed into the arrival gate, a telescoping ramp moved out to meet it. Fifty of the passengers disembarked. Men from the service company, Samor, attacked the cargo holds. They left the front compartment untouched, unloaded the center one of empty pallets and mail bags, and began to load on the baggage of passengers who were boarding at Paris. With passengers still buying tickets, last-minute luggage would have to go later, on another plane. Four Samor men unloaded baggage and mail from the rear cargo compartment, and when it was empty, one of them, a big young Al-

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He had closed the rear cargo door at 11:35, just 33 minutes after landing and 5 minutes after completion of the refueling. The door had delayed them before when they couldn't get it closed, and sometimes the baggage handlers had had to close it manually. There had been nearly a dozen recorded cargo door delays in the past year. But this morning, it would not be the door causing delays. From the chaos at the ticketing counters, it was clear that it would be the passengers.

Captain Nejat Berkoz would undoubtedly have welcomed the delay and a chance to stretch. It had been a long flight from Istanbul. The rest of his cockpit crew got up and moved around the airplane. They were virtually pioneers on the airline's DC-10s. All three—Berkoz, his cocaptain, Oral Ulusman (in Turkey, all pilots are captains), and his flight engineer, Erhan Ozer, had been sent to the manufacturer's plant at Long Beach, California, for simulator training on the same day, January 24, 1973, just over a year before, and just six weeks after Turk Hava Yollari had taken delivery of the first of its three DC-10s.

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Now flights were routine. Berkoz had 438 hours on the DC-10, Ulusman had 628, and Ozer had 775 hours, a respectable body of experience. The plane itself had 2,955 hours and 52 minutes, still just the beginning of the 60,000 flight hours she'd been built for.

Berkoz would have checked his watch. The stop in Paris was running over schedule. Loading of passengers would delay them half

an hour. Departure was now set for 12:30. The crew settled back into the cockpit to prepare for the 50-minute flight that would complete their long mission. At 12:11 and 30 seconds, they made their first contact with Orly Control and began the preflight procedures and checklists, getting routing, altitudes, checking fuel, weather, systems. Everything was going smoothly. There was no hint of trouble. Pilots are acutely aware of air safety, always—as they like to joke—the first ones at the scene of an accident. They have a fierce will to live and a positive attitude toward flight. Though Ozer had talked of death to his wife through his poetry, he worked to deny it by these methodical preparations for flight.

On the ground, the service men had loaded all the baggage they were going to load and closed the doors of the center hold at 12:10, but the loading of passengers was continuing. By 12:18, they had their clearance from Orly Control, the first of four control agencies that would monitor TC-JAV, handing it from one to the other as it moved out to the runway and through the first stages of flight. At 6,000 feet, Orly Control would hand the big plane off to Paris Control.

Departure from the gate had been delayed at the last minute, as the twenty extra passengers rushed aboard and hunted for the few remaining seats. With no seat assignments, it had been everyone for himself, and the 8 cabin attendants were smilingly plying the aisles trying to get everyone seated in the three big compartments, settling and soothing the people who had boarded at Paris

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Most of the passengers pressing aboard that morning had never flown in a DC-10, but there was casual assumption of a safe flight. In the sixty-five years since Louis Blériot had made the first precarious crossing of the English Channel by air, the awe had

gone out of it. Psychologically, Paris to London was now a shuttle run. The passengers, nearly two hundred of them British, began to lean back and settle in. The final weight and balance forms were handed into the cockpit. Even with all the extra passengers, they were still well within their maximum weight allowance of 430,000 pounds.

At 12:19 the cabin door was locked, closing out the confusion of the airport and severing almost the last of the physical support links with the ground. The most symbolic act of any flight, the closing of the door shifts almost baronial powers and obligations to the captain's shoulders, and gives each flight its own unique dynamic. To an engineer, the closing of the doors gives the aircraft

back the integrity it was designed to have, making it once more a sealed pressure vessel ready to test itself in the thin, alien air

back the integrity it was designed to have, making it once more a sealed pressure vessel ready to test itself in the thin, alien air of cruising altitudes. And to him, the humbler act of closing the rear cargo door is as important as the more symbolic closing up front.

Mahmoudi, the baggage handler, had completed that 45 minutes ago at the rear of the DC-10. The amber light in the cockpit that warns of an improperly locked door was out. The wheel chocks were removed, and at 12:20, a tractor pushed TC-JAV back from the gate. The aircraft taxied out to Runway 08, escorted to the threshold by two mobile gendarmes. Berkoz would take off to the east. He was cleared to climb initially to 4,000 feet, and then to 6,000 feet. Weather conditions were good. Temperature was 43 degrees Fahrenheit, chilly but well above freezing. Light cumulus clouds between 1,500 and 3,000 feet. Visibility more than 9 miles.

He taxied onto the runway and held, waiting for takeoff clearance. Momentarily still, he kept his right hand firmly on the throttles, adjusting his grip and flexing his fingers, waiting. The cocaptain's hands performed a deft cockpit ballet, moving with graceful precision over the final buttons and switches, double checking. 334 passengers and the crew of 12 were strapped in for takeoff.

The takeoff roll started at 12:31. As the captain pushed the throttles decisively forward, three mighty turbo-fan engines, each with 40,000 pounds of thrust, accelerated the DC-10 down the runway. The plane reached V1—the go/no go speed—the speed at which they could still have chopped the throttles and aborted. Everything checked out. Past V1, the captain moved his right hand swiftly from the throttles to the wheel, irreversibly committed to flight. They raced on, gaining a speed of 143 knots and rotated, lifting the nose into the air at a speed 4 knots below the precalculated takeoff—or V2-speed—when the airplane could safely take off even with the loss of an engine. The great bird lifted

safely take off even with the loss of an engine. The great bird lifted easily. Flight 981 was committed to the last leg of its long mission. It was almost 12:32.

Still under Orly Control, the plane climbed through lofty cumulus and light winds to 6,000 feet. Berkoz would follow Departure Number 18, which would vector him to three checkpoints—Tournan, Coulommiers, and Montdidier. At 12:34, Flight 981 contacted Orly Departure Control to report reaching 6,000 feet and was handed off to Paris Control. Flight 981 contacted Paris Control at 12:36—4 minutes into the flight—and was cleared to Flight Level 230—an altitude of 23,000 feet. They were then instructed to turn left, toward the Montdidier checkpoint. Flight 981 turned to the northwest on a heading of 345 degrees. At 12:37, the flight

called in to report reaching 7,000 feet, its last coherent transmission.

They climbed swiftly through 7,000 feet . . . 9,000 feet, at an air speed of 300 knots—345 miles per hour.

In the cabin, everyone was relaxing after takeoff, lighting cigarettes, and chatting. The young rugby fans would have carried their high spirits with them into the air, with laughing and joking up and down the aisle. Steve Backhouse, traveling with friends from the Davenport Rugby Club, had headed to the airport in a very happy mood, according to a friend who had seen him off in a taxi. Two of the rugby boys from Bury St. Edmunds hadn't got out of bed and had missed the flight.

With so many men aboard, it was impossible for the four models not to be actively looked at. Prudence had never liked being "chatted up." She was intent on London and knew Stephen would be on his way to Heathrow.

There were six people at the rear of the plane whose random choice of seats beside each other would cast them in a special destiny, one that was to become symbolic of the special fears that haunt a plane crash. Omer Faruk Afir had been on the plane since Turkey. One of a number of young Turkish students aboard, he was on his way to London to attend medical school and looked forward to becoming a doctor like his father. In Paris, others had taken the seats around him. Three women and two young Japanese men. Daniele Cam-ha Nguyen Thi was a twenty-three-year-old Vietnamese girl studying in France; and Georgiana Byatt, a forty-six-year-old primary schoolteacher from Middlesex returning from a holiday in Spain, traveling with a friend, Bessie Brown, a crossing guard at the same school. The two Japanese men were new friends on the trip—Tsukuro Yoshitake, who would be joining the Tomen trading company, and Tadaharu Sakata, who would join a bank. Sakata would have to make his own way in the business world, unaided by money or position. His only brother had died five years earlier in a gas leak accident, and now it would be his duty to support his father, already sick with diabetes. But he had finished fifth out of eight hundred in his graduating class. And

The six sitting at the left rear of the fuselage in two banks of triple seats were a random sampling of any international flight in Europe. Their choice of seats bound them to a macabre destiny.

The plane climbed through 9,000 . . . 10,000 feet into the thinner air that makes climbers and skiers gasp, their hearts palpitate. But passengers sat back breathing normally, taking for granted the sophisticated environmental control system that maintained

the air in the plane at comfortable pressures. Now it meant simply comfort. But at 40,000 feet, this cocoon of thick, compressed air meant survival for the human organism.

But who notices air? Innocent. Invisible. Apparently the same on both sides of the window.

There was no way to see or to feel that, with every foot of altitude, the air trapped in the fuselage was growing more frustrated by containment. It was roiling with eagerness to expand, to escape. And as it responded to the suck of the partial vacuum outside, it pressed out, putting stress on every rivet, latch, and window, every square inch of the thin, silvery skin. Pushing against the shell with several times the force of a hurricane, it searched for a way out.

The plane climbed through 11,500 feet, sprinting up at 2,200 feet a minute toward its assigned flight level, with the pressure differential between the cabin and the air outside building rapidly

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At 12:39 and 56 seconds *—a momet frozen in time by the plane's cockpit voice recorder—the air found its escape route. In one explosive microsecond, the caged hurricane burst through the rear cargo door, shearing off the bolts that held it to the fuselage, and flinging it—with six passengers still in their seats—down to the quiet French countryside.

On radar, stunned controllers watched, helpless. A battery of radar screens had been monitoring the moving blip that was Flight 981. At the instant the door came off, the image on the screens changed. On secondary radar, the blip simply vanished, leaving for several seconds the imprint of its altitude—13,000 feet. On the primary radar screen, the controller watched in horror as the image of Flight 981 split in two and became a double image. He had "seen" the door come off. As he watched, the two blips separated from each other on the screen. One stayed fixed at 24 miles northeast of Orly, frozen on the screen for two or three minutes. It was the door and the bodies free falling to the freshly plowed fields of St. Pathus. The second image followed a trajectory to the left, reached a heading of 280 degrees, to the northwest, and van-

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Shortly after the image split, there were alerts by radio, too, that something had gone wrong with Flight 981. At 12:40 and thirteen seconds, Paris Control heard a garbled transmission of Turkish voices above the blaring of the depressurization alarm and,

* There is a 30-second discrepancy between this time taken from the cockpit voice recorder and times taken from the flight data recorder. Both, however, are in agreement on duration of flight and crisis.

then, the overspeed klaxon. All transmissions ceased as the blip disappeared from the screen.

The controller tried to reach Flight 981. "981, come in . . . 981 do you read me? . . . Come in, 981 . . . 981 . . ." Eight times he tried to reach them. There was no response. After 9 minutes of flight, she had vanished.

In the cockpit, the crisis had hit the crew like a lightning strike. There was the sudden, thunderous noise of decompression as the air evacuated and violent jolts kicked the plane sideways. An explosive burst of dust and debris flew up into the cockpit, temporarily blinding them. From a climb of 3 or 4 degrees, the nose pitched down violently into a dive. The plane yawed hard left because of

autopilot disengaged instantly and the crew grabbed for control. Scanning instruments with ferocious speed and intensity, they had no idea what had happened, though Ulusman snapped out, "The fuselage has burst!" They did not know that the cabin floor had collapsed, severing and jamming the control cables that ran through the floor from cockpit to tail—their lifeline. They knew they were yawing hard left. And that elevators were forcing the nose down, jammed, inoperative—their prime means of pitch control. Within 22 seconds, the nose was down 20 degrees. They had to get the nose up. Berkoz yelled, *"Bring it up . . . pull her nose up!"* Ulusman pulled back with all his strength on the controls. But he could not overpower the dive. *"I can't bring it up. She doesn't respond!"*

Speed, increasing with pitch, had risen viciously from 300 to 362 knots. Number 2—the mighty engine on the tail—was already out. Dead. Windmilling uselessly. Now they cut the power on the underwing engines 1 and 3 in a desperate effort to stop the buildup of speed. But speed kept rising. They were diving at over 10,000 feet a minute. They would crash in seconds unless they could get the nose up. They were fighting for their lives, and for the lives of 334 passengers. But the rudder was jammed left. Elevators had locked the nose down. Number 2 engine was out. The exchanges were terse, as they searched frantically for an answer. *"Nothing is left."* Thirty-four seconds into the crisis. Speed was still rising . . . 400 . . . 410 knots. The aerodynamic scream was jerking up heads of Sunday strollers in the woods below. *"7,000 feet!"* Forty seconds to impact at the speed of their dive. *"Hydraulics?"* Hydraulics powered all their controls. Were they all gone?

But maybe something was left. For gradually the nose was coming up. It was coming up! Was it the one-in-a-thousand chance that they were flying the plane through the autopilot, using its limited

authority to save them from crashing? Or was it simply the effect of the increasing speeds, for speed itself will pull the nose up. It came up from 20 degrees to 10, 9 . . . to 6, 5. They were leveling out. And speed had stabilized at 430 knots. But it was too late. They were too low. Flight 981 was a doomed and helpless bird. There were the desperate words, *"We've lost it."* The straight pines of Ermenonville Forest were rushing toward them like spears as they came in, left wing 17 degrees low, pitch nearly level, 4 degrees down, and speed at 423 knots. The final voiceless emission from Flight 981 ended at 12:41 and 13 seconds. At impact.

Impact is an experience that is beyond integration. An event so violent that the mind refuses it.

Disintegration of the fuselage began instantly. Number 1 engine, hung from the low left wing, impacted first, and began to break up immediately. As it impacted with a large tree, the stage 1 fan disk acted as a punch die, cutting a core right through the tree and driving it, like a wooden plug, into the bore of the engine where it was later found. The rear engine told a story of even more appalling violence. As the momentum that had built up at a speed of almost 500 miles an hour was suddenly slowed by the convulsive impact of the hull, the massive rear engine, poised on the tail like a stone in a slingshot, was catapulted in an arcing trajectory at two thirds the speed of sound for half a mile beyond the main impact area. The same forces ripped off the rear of the hull and sent it, with ninety-five passengers, hurtling along the same path.

Within ten seconds, the hull—stripped of wings and engines—thundered through half a mile of forest, disintegrating progressively as it decelerated, literally raked to bits by the stiff pines. Before the bodies had even completed initial reaction to impact—feet shooting up and hips jamming down into the seat—the violent destruction of their protective envelope, the turmoil of flailing, crushing, and wrenching, of impaling by flying beams, metal, and sharp trees, would have killed all but the ninety-five catapulted to the far end of the crash site when the rear of the fuselage snapped off. For them, annihilation of sensation would be doubly guaranteed by lethal whiplash.

Within ten or fifteen seconds, the last piece of metal would have tumbled to rest, and there would have been no more sound. A small hand lay on the snow, still clutched by a larger female hand. For that child, for her mother—for all the humans who perished with them—there had been no "agony of death." Only agony for those left behind.

In those last few seconds of silence and certainty of death, the

poem Flight Engineer Ozer had written just weeks before to his wife took on an unbearable poignancy:

I want to call you,
I want you to hear me.
I wonder if you can feel
One day my last breath.

CHAPTER TWO

DID THEY FEEL ANYTHING?

BEFORE THE INITIATION of the 77 second nightmare, all had been perfectly normal in the cabin. Babies frightened by the noise and unfamiliarity of takeoff were probably fussing. Mothers would be trying to comfort them. Flight attendants would be moving up the aisles within six or seven minutes of takeoff, pitched forward as if walking against a wind. But passengers would still be in their seats. The NO SMOKING sign would have gone off shortly after the gear was raised, and many would already have lit up a cigarette. Between eight and nine minutes into the flight, a contagious click of seatbelts would riffle through the cabin, as a sense of confidence began to spread. The FASTEN SEAT BELT sign would probably still be on, though, and most passengers would be loosening, rather than unbuckling, their belts. People who had been apprehensive at takeoff would be relaxing tensed muscles, still going through a period of adjustment. They would be settling back, interested primarily in comfort, unprepared for emergency as they might be at landing, the most dangerous phase of flight.

When the decompression hit, it would not be the sound of a bomb or gun blast, but a more thunderous rush, as if a car window had been suddenly opened at 350 miles an hour. The explosive blast of escaping air would sweep loose objects with it, pull down ceiling panels and pop panels up from the floor. As the pressure and temperature dropped, fog would fill the cabin, making many think, "SMOKE . . . FIRE!" The initial response would be the startle reflex, with arms and legs snapping out, spread eagled, muscles tensing. Fingers would go straight, though anyone already

gripping the armrest would probably dig his fingers in harder, instinctively trying to hold the plane up. In the shock, air would escape from the lungs, making people say a dead "Oh." If some panicked at decompression, they would probably not try to undo their seat belts and run from the threat; they would sit silent, paralyzed from action. Simultaneous with the first reflex bodies would be jerked up hard against their seat belts, as the nose suddenly dropped. For an instant, they would experience negative G, the sensation of cresting a hill on a roller coaster, or of going over a big rise in the road—the sensation that hits you in the pit of the stomach and makes children scream "Wheeee!" It may have lifted them out of their seats. Then, torsos would lean, perhaps flail, to the right as the airplane yawed and the left wing dropped. But the yaw would not be precipitous; it would not be a convulsive, heart-stopping movement. But the two events combined—the wing down, and a dive angle that was many times steeper than anything most would ever have experienced, and getting steeper—would be alarmingly abnormal.

Though most would not panic, a general feeling of anxiety would sweep the pressure vessel. Bodies would become hyperactive, muscles tense, senses supersharp. Awareness and memory would become acute. Stress would shrink the range of vision to a narrow focus in which each detail would be seen and remembered. Time would snap into a new dimension, with seconds lengthening to vivid detail-filled lifetimes in the remarkable phenomenon that lets a fighter pilot take an hour to describe a three-minute aerial battle. Life's vignettes would be relived as if time had stopped. Physical movements would be discoordinated as people tried to handle their newly hypertense bodies. Stress would strip them of the ability to judge their own forces, and movements would be overdone, like bad acting.

All would be alert, intent on "What's happening? What hit us?" trying to figure it out, waiting for the next event. In an instant, the initial violence would pass, and they would fall back into their seats as almost normal G forces returned. There might be a certain sense of relief. And *hope* would be heard in a flurry of comments that put danger in the past tense, behind them—"What do you think it

All would be alert, intent on "What's happening? What hit us?" trying to figure it out, waiting for the next event. In an instant, the initial violence would pass, and they would fall back into their seats as almost normal G forces returned. There might be a certain sense of relief. And *hope* would be heard in a flurry of comments that put danger in the past tense, behind them—"What do you think it was?" "I wonder what hit us?" But there would be no end to the anxiety, for wasn't the plane going faster? The dive getting steeper? —a sensation exaggerated by the banking of the plane. Everyone would be vibrantly alert now to ANY abnormality, retrieving more rapidly than a computer any information that could help them figure out what was happening. What had they seen, read, heard, been taught? They would search for clues. But there were few physical references to help them. The seat in front. The people immediately adjacent. No answers outside the small windows.

Most would think "MIDAIR!" Seeing the fog, some would think "SMOKE!" and search for signs of fire. All would release tension in their own way, grasping desperately for normalcy, exaggerating it. There would be nervous laughter. Mothers would hug and soothe their children, diverting their own fears. The dependent would be more dependent; strong husbands more reassuring. Strong relationships would be reconfirmed by holding hands tightly, quietly. No protestations of love. Mostly silence, as minds raced. Cigarettes would be grabbed. And magazines. The strongly religious might pray, or handle beads or crosses. Cultural differences would become distinct. People from the Middle East, Italy, or any of the Latin

more dependent, strong husbands more reassuring. Strong relationships would be reconfirmed by holding hands tightly, quietly. No protestations of love. Mostly silence, as minds raced. Cigarettes would be grabbed. And magazines. The strongly religious might pray, or handle beads or crosses. Cultural differences would become distinct. People from the Middle East, Italy, or any of the Latin countries might cry out and fling their arms; a man from the northern Anglo-Saxon countries might bolster his own self-control by saying with disgust, "What a bloody fuss she's making!" Others would be drawing on every four letter word they knew. People are profane in crisis. Some would run a frantic checklist of all the eventualities, finding comfort in the process of elimination. Others would find security in tightening their seat belts, or in pulling their clothes around them. A bloodied parka proved to Japanese parents that their son had pulled his hood up over his head.

There would be a compulsion to act to overcome the danger, but few actions were possible. As they quickly discovered that there was nothing constructive to be done, they might hurl hostility at the pilot and crew. "Why doesn't he come on and tell us what's happening?" He was their window on the world. What was he doing up there? And yet, things were not getting worse. Some might be conscious of an increase in speed and the rapid loss in altitude, but at least the dive wasn't getting any steeper. In fact, was it only wishful thinking . . . or was it actually decreasing? Gravity forces would be pressing them forward so gently that many would not notice it. Some would think, "He's diving to a lower altitude." For safety.

And then, before impact, the nose was clearly coming up. And up! "We're leveling off, we're pulling out!" "Whew! Thank God!" Mothers would squeeze small hands with hope. "It's going to be all right, darling . . . going to be all right." Relief would wash through the pressure shell.

Most of the 328 passengers still aboard Flight 981 were probably looking around, apprehensive but hopeful, as they came into the trees, unaware that these were the last moments of their lives.

The experience of the six who fell from the plane was quite different; images of their ordeal will always haunt the crash. The collapse of the floor was violent enough to tear loose one of the flight attendants' seats and two banks of triple seats, to hurl them and their six passengers into the cargo hold below to be sucked out into the slipstream. The three men and three women at the

left rear had no time to think about their fate. As seats and bodies ripped past shattered metal beams, torn cables, sharp floor panels, and out the hole, the six were almost certainly knocked unconscious, or killed. The young Turk was still strapped in and fell attached to his seat. Reportedly, all except him suffered severe and similar head damage that suggests death may have been caused during the terrible exit. Probably all were spared awareness as they were whipped into the slipstream.

If any were swept out cleanly, without damage, there could have been consciousness, but not awareness in the normal sense. For the mind would throw up protective walls around the delicate human mechanism. The initial experience would be so violent that there would be complete disorientation, with a rush of events the mind would not begin to catalog and comprehend in any rational way. Within seconds, this could be replaced by panic, the negative panic that throws people into a catatonic state. Eyes could close. The mind would either blank out or race uncomprehendingly. Thoughts or words, if there were any, would be repeated over and over. In this state, they could have fallen the 2 miles insulated from awareness. For others, the initial disorientation could have passed in four or five seconds, and awareness could have returned. But in crisis, it could have been a detached awareness, allowing a passenger to view the incomprehensible events happening to her as if she were a dispassionate observer: "Mary's falling. She's bleeding. I hope she survives. She wants it to be over." If there was blood—if Mary had been damaged by the tumult of exit—she would not feel it; for there would be too many other more acute sensations fighting for dominance, crowding out the sensation of pain. The fall could even have been euphoric, silent, with no sensation of plummeting to earth. The earth would not rush up until the final seconds, and Mary might have imagined herself suspended, perhaps from the plane.

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Yet the six had fallen fast, reaching a maximum speed of 135 mph and impacting at a terminal velocity of about 120 mph in the denser air of lower altitudes. Attached to their seats, or falling free, they would have tumbled uncontrollably, probably never regaining clear orientation to events or their environment, never seeing the ground. In spinning, blood pressures could have dramatically altered consciousness. But if any had been aware and clearly oriented to their situation, they would have fought for life, turning every fiber of mind to finding a way out. For "the habit of living has become an addiction." But attempts to fight back would be thwarted by the complete physical helplessness of their situation. There was nothing to grasp. No way to control the fall. No hope that they could survive it. Not prepared as skydivers

would have been, they would not know to flip onto their backs and spread eagle as they fell to distribute the energies at impact, or to use the half-mile circle-of-choice they had to maneuver away from trees and pavement to green or plowed fields. It was chance that brought them down in plowed fields, a factor that could conceivably have worked toward their survival. Though the odds of preparedness making any difference are very slim indeed, people have fallen remarkable distances and lived. A Russian stewardess survived a fall of 3,000 feet; a Russian pilot has survived a fall of 29,000 feet. A navy parachute rigger jumping in a test program free fell 16,000 feet with only his streaming unopened chute slowing his fall, and recovered to become a flight instructor and charter pilot.

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Pilots fight all the way down for their own lives, and for the ship's. Unlike passengers, they are actively in command of their fates and keep very busy. When they do realize that, for reasons known or unknown, they have lost control—blown it!—they respond with frustrated resignation. Though the words are always edited out for the sake of the surviving families, it is well known that the pilot's last words on the cockpit voice recorder are often "Oh, shit!" It is said as if he had just hit his thumb with a hammer. Or missed the last train.

With no survival tasks to preoccupy them, there would be loss of hope for those falling. And then, knowledge of death. This is the part that would cause nightmares to the families. But from the little we know, it seems that in that flash of transition from the fight for life to the recognition of imminent death, another threshold is leaped. Fighter pilots coming in for a crash have described it as a state of anticipation, of exhilarated fascination with "What will it be like?" A woman, brought back by doctors from "death," resented the interference with her dying. It has been described as "a remarkable sensation of detachment, of an extraordinary sense of peace, calm, and total painlessness. . . ." "The dying appear to go through a withdrawal, a preparation for death, as though intuitively familiar with the process." The renowned physician William Osler believed that there was "no agony of death."

Impact in the field at St. Pathus would have occurred at almost the same moment as impact in the forest. Death would have been instantaneous. There would be no conscious screams of terror. If there were human sounds, they would be the involuntary expulsions of air. If anything had been heard as they neared the ground, it would more likely have been the vibration of their clothes at high speed, making the tumbling bodies sound like an approaching artillery barrage. Then, a thud, as they impacted deeply into the earth.

Aboard the plane, there would have been a ring of panic around the hole where the seats had vanished. A zone of partially collapsed floor, seats askew, people hanging from their seat belts, trying to resist the suction that would continue through the flight, terrified to breathe or move. There would be a tangle of shiny bent or snapped cables that any mechanically aware passenger would quickly guess were vital to control. Here, there would probably be no noise or movement. Only the blanked minds and physical paralysis of negative panic. People resort to the mobile panic glorified in disaster movies only when there is a clearly marked exit to safety, and it is blocked, as when crowds jam the door from a burning theater. There would be no stampede toward this exit.

In the cockpit, the crew would be obsessed with "What the hell is happening?" and with saving the plane.

After the crash, there were rumors that, in crisis, Turkish pilots would throw up their hands and wait the will of Allah. There were fears that they might have reverted to old culture patterns. Pilots who had trained with them in NATO remembered that "flying wing" on a Turk was a "near-*kamikazi*" experience; that they would shrug off incredible errors with a resigned, "I didn't understand." And maybe they didn't. Turks are not yet fully at home with twentieth century technology, as demonstrated by the training of DC-10 flight engineers who would prepare for takeoff with 40,000 pound errors in takeoff weight, and without fuel logs. But with experience, they can be among the world's best—highly motivated and intelligent. Clearly, they would fight to save a plane. With origins as barbarous steppes horsemen, Turks have historically been the most aggressive of the Islamic groups, long in contact with the West's adversary spirit. The captains of Flight 981 were seasoned military and commercial pilots with well over 12,000 flight hours between them—enough for imprinting sound crisis responses. Turkish pilots are potentially perhaps even better than U.S. pilots because they obey rules and more easily suppress their egos for the good of the mission. If the Turkish crew *did* engage the autopilot to try to use its limited control to recover from the dive—a remote but tantalizing possibility—it was a cool and posi-

that powered the autopilot, there will always remain the intriguing possibility that they were flying her out on autopilot at the moment of impact.

On March 3, 1974, a cargo door failure had initiated a series of secondary failures that, in 77 seconds, had brought a giant plane screaming down at nearly 500 mph into the pine trees of Ermenonville Forest, 23 miles northeast of Paris. With the sturdy pines act-

ing "like a giant shredding machine," the aircraft and its occupants had been utterly destroyed.

It was the worst, the largest, the most unspeakable crash in aviation history. It was the crash that had been haunting the aviation insurers since the 747 had started commercial flights in 1970. The crash of a fully loaded wide-body airplane.

Statistically, it was overdue. The loss of one wide-body plane had been predicted for the first year of operation.

But when it came, only a small, highly specialized group of professionals was ready to respond. Of all those who may have speculated, few had really accepted the possibility. Compulsive Peter Pans, Westerners have tried to deny death in any form. But death by air crash has a special terror.

There is still a mystique about moving through the skies. And our ability to get us up there has raced ahead of our ability to handle it emotionally. As Canadian author Hugh McLellan suggested, perhaps our technological society has "outtraveled its own

gested, perhaps our technological society has "outtraveled its own soul." Getting into a plane is an act of faith in high technology. And when a transport falls from the sky, we suffer not only the shock of loss, but also a shaken faith in the mechanistic way. A faith that must be reaffirmed. So a frantic search for cause follows. "Fixes" are made. And we try to believe it will never happen again. We keep trusting that if the wax is going to melt, it won't be on *our* wings.

Committed to the perfectibility of men and machines, we force air safety up to higher and higher levels, until flying becomes safer than taking a bath. Yet we fly suspecting that flight itself is a violation of one of the most tyrannical of all physical forces—gravity—and knowing that implicit in getting off the ground are some basic compromises, one of which is the compromise with perfect safety. One of the most popular pieces of received wisdom in aviation is: "Sure, we could build a perfectly safe plane. But it wouldn't fly."

An air crash is a public, highly visible event. And this was the most visible of all air crashes. The glare of public attention would be on it from minutes after the crash. The grim horror of it would be brought to many families by television hours before they had any idea that they would be involved.

From the stark lights that lit the barren hangar where the wreckage was examined, to the white-hot scrutiny by journalists, investigators, lawyers, and governments, the DC-10 crash would become a prisoner held under harsh lights until he has told everything he knows.

From the moment of impact, the *Paris Air Crash*, as it quickly became known on legal briefs, would become the most publicized,

most controversial, and potentially most influential aviation disaster in history. The world's shock at the enormous loss of life would put unprecedented pressure on getting at the truth. And before the last ripples died away, the search for cause and culpability would carry us far beyond the testing of the structural integrity of a cargo door and the pressure vessel it should have sealed, to the testing of the most basic institutions, systems, strengths, and values of all the nations and individuals involved.